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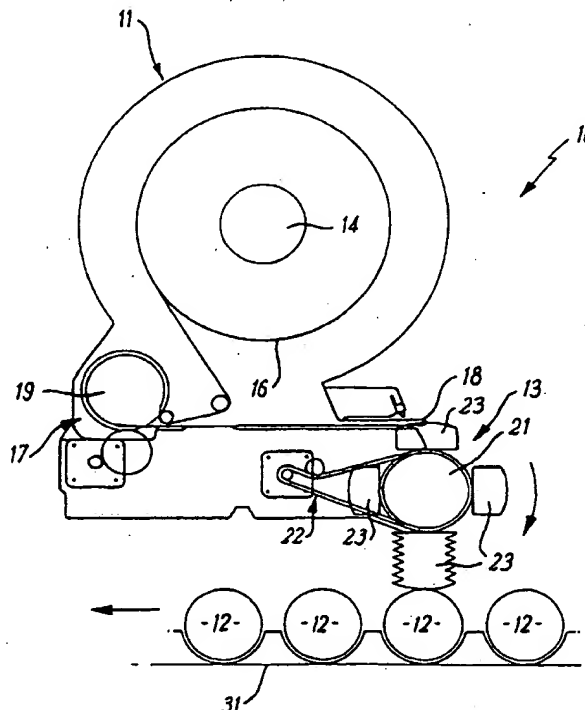
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(54) Title: LABELLING APPARATUS

(57) Abstract

A labelling apparatus (10) comprises a detachable label cassette (11) which presents labels to be attached to fruit and/or vegetables (12) and a label applicator (13) which receives the label and applies it to the fruit and/or vegetables. Label strip is pulled off the label cassette (11) by a label drive mechanism and the movement of the applicator (13) is driven by an applicator drive mechanism (22) both of which include stepper motor drives. A control arrangement (24) controls both the label drive mechanism and the applicator drive mechanism and the control arrangement (24) includes a memory device (32) which stores parameters relating to different labels. The use of stepper motors in the drives and the use of a memory (32) in the control arrangement makes it possible to provide for automatic set up on initiation or label change.



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- 1 -

LABELLING APPARATUS

This invention relates to labelling apparatus.

In European Patent Application No.83308035.1 there is disclosed a
5 labelling apparatus in which a detachable label cassette supplies labels to
a label applicator in the form of multiple bellows mounted at spaced apart
positions on a rotatable head, the labels being sequentially taken up by
respective bellows and applied to fruit and/or vegetables by rotation of the
head. The supply of labels from the cassette and movement of the
10 applicator are controlled by respective drives which are engaged or not
engaged by use of mechanical clutch mechanisms.

In U.S. Patent No. 5,829,351 there is disclosed a labelling apparatus
utilizing a detachable label cassette and a label applicator utilizing multiple
bellows. A single stepper motor is utilized in conjunction with two gear
15 trains to drive both the label cassette to supply the labels and to
simultaneously rotate the head.

A problem arises with these known label apparatus insofar as it is
necessary, if a different size of label is to be used to either modify the
clutch mechanism or to change at least one drive gear from part of one of
20 the gear trains to ensure accurate application of the different size of label.
This is obviously time consuming and interrupts operation of the apparatus.

A further problem arises with the known apparatus of European

- 2 -

Patent Application No. 83308035 in that when a cassette of labels is attached to the machine, the machine must be manually set such that the first label is in the correct position for labelling to commence. Consequently when large numbers of applicators are used, and when there is the need for frequent label changes, this necessity for manual set-up becomes labourious and time consuming. Further manual set-up increases the time for which the operation of the machine is interrupted.

It is accordingly an object of the present invention to overcome or at least minimise the above-mentioned problems.

Thus, and in accordance with the present invention there is provided a labelling apparatus comprising a label supply and a label applicator, said label supply being operable to supply labels to said label applicator and said applicator being operable to apply said labels to fruit and vegetables, wherein said label supply is driven by a label drive mechanism and said label applicator is driven by an applicator drive mechanism, said drive mechanisms comprising respective stepper motor drives.

With this arrangement it is possible for a label applicator to be provided which can be manufactured in a small size and differently sized labels can be accommodated without requiring any mechanical modification to the apparatus.

The present invention utilizes independent stepper motor powered drive gear trains to rotate the head and to supply labels from the cassette.

- 3 -

The use of two stepper motor drives rather than the single stepper motor drive of the prior art facilitates the use of considerably smaller stepper motors in the present invention. The use of the smaller stepper motors not only avoids the requirement of changing at least one drive gear when different sized labels are used, but, also, facilitates a reduction of the overall width of the machine of the present invention. For example, labellers according to the present invention can be arranged side-by-side to apply labels to two parallel lanes separated by only 2.6 inches (66 mm) centre-to-centre. For example, the apparatus of U.S. Patent No. 5,829,351 requires a minimum lane separation of 4 inches centre-to-centre. The present invention, therefore, achieves more than a 35% reduction in minimum lane separation.

It is preferred that the stepper motors are adapted so as to be capable of driving said label supply and said label applicator respectively in forward and reverse directions.

Preferably movement of said labels and movement of said applicator are sensed by respective sensors, said respective sensors being connected to said label drive mechanism and said applicator drive mechanism respectively whereby positioning of the applicator and labels can be controlled accurately.

Preferably the apparatus also includes a memory device, said memory device being connected to said respective drive mechanisms and being

- 4 -

operable to send drive signals to said drive mechanisms. Preferably the memory device stores a series of parameters relating to different labels and the apparatus may also comprise a user operable input linked to said memory device whereby a user can input data or select one or more of said labels or parameters stored in the memory device. The memory device may comprise an electrically erasable read-only memory (EEPROM).

The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Fig.1 is a schematic perspective view of a labelling apparatus according to the present invention; and

Fig.2 is a diagrammatic representation of the drive mechanism, and control therefor, for use with the labelling apparatus of Fig.1.

Referring now to Fig.1 of the drawings there is shown one form of improved labelling apparatus according to the invention.

The labelling apparatus 10 comprises a detachable label cassette 11 which presents labels (not shown) to be attached to fruit and/or vegetables 12 at a label transfer position, and a label applicator 13 which receives the label at the label transfer position and subsequently applies it to the fruit and/or vegetables.

The label cassette 11 comprises a hub 14 upon which is mounted a reel of label strip 16. The label strip 16 comprises a label carrier upon which are removably mounted a multiplicity of labels at substantially equal

- 5 -

spacing therealong. The labels are removably attached to the carrier strip by way of a pressure sensitive adhesive. The cassette 11 also includes an integral label drive mechanism 17 which acts to pull the label strip 16 from the reel and advance it towards the label transfer position. The cassette 5 11 still further includes a separator plate 18 which is adapted to separate labels from the label carrier at the label transfer position whereby the label can be transferred to the label applicator 13. The cassette is adapted to be removably attached to the machine. It is envisaged that labels will be provided disposed within the cassette whereby changing labels, or 10 replenishing the supply, will involve removing one cassette and replacing with another.

The drive mechanism for the label strip 16 comprises a haul-off roller 19 which is adapted to engage the label strip 16 and pull the strip 16 off the reel. Once pulled off the reel, the driving of the haul-off roller 19 15 advances the label strip 16 towards the separator plate 18. The haul-off roller 19 is driven by a stepper motor which can be directly connected to the roller or can be linked via intermediate gearing or any other suitable connection.

The label applicator 13 comprises a body 21 which is adapted to be 20 driven rotatably by an applicator drive mechanism 22. The body 21 carries a multiplicity of applicator heads 23 in the form of expandable bellows which are equally spaced around the periphery of the body 21. The

- 6 -

configuration of the rotatable body 21 and the bellows 23 are as described in published European Patent Application No.83308035.1 and, therefore, these features will not be described further herein. The rotatable body 21 is adapted to allow connection of each bellows to either a vacuum (to contract the bellows) or a low pressure air supply (to expand the bellows). This adaptation is also described in the above-mentioned European Patent Application and, therefore, these features will also not be described further herein.

The applicator drive mechanism 22 also comprises a stepper motor which is connected directly to the body 21 and is operable to cause rotation thereof to successively bring each bellows 23 respectively to a label receiving position to receive a label and a label applying position at which a label received by the bellows is applied to a fruit or vegetable. The label receiving position of the bellows 23 is that position of the bellows where a label positioned at the label transfer point can be taken up by the bellows 23.

The labelling apparatus 10 also includes a control arrangement 24 to which the label drive mechanism 17 and applicator drive mechanism 22 are connected. The control arrangement 24 comprises a label sensor 26 to sense the leading edge of the label as it reaches the separator plate 18 and a sensor 27 to sense the position of a bellows 23 on the body 21 relative to a label receiving position, both of these sensors 26, 27 being connected

- 7 -

via a control device 28 to the label and applicator drive mechanisms 17 and 22. A fruit or vegetable sensor 29 is also provided which detects fruit or vegetables to be labelled and this sensor is also linked to the control device 28.

5 The control device comprises a micro processor which incorporates an electrically alterable memory in any suitable form, for example electrically erasable read-only memory (EEPROM).

 In use, the labelling apparatus 10 is mounted above a conveyor 31 upon which is disposed fruit and vegetables 12 to be labelled as shown schematically in Fig.1. When the labelling apparatus 10 is first used, or one type of label is replaced with a different type by removing the cassette and replacing it with another cassette or replenishing the reel of labels in the removed cassette and replacing it, the apparatus undergoes an initiation sequence. This is as follows:-

15 Firstly, the label drive mechanism 17 is driven in a reverse direction to remove any label from the field of view of the label sensor 26. Simultaneously the applicator drive mechanism 22 is driven in reverse until a bellows 23 is detected by the sensor 27 and its position can then be accurately determined.

20 The label drive mechanism 17 then advances the label strip 26 towards the separator plate 18 by pulling the label strip 16 from the reel. As soon as a leading edge of the label is detected by the label sensor 26 a

- 8 -

signal is sent to the control device 28 to halt the label drive mechanism 17. This results in the label being stopped at a predetermined position short of the label transfer position, a position which will hereafter be referred to as a label holding position. This predetermined position is dependent upon the size of the label to be applied. The applicator drive mechanism 22 also rotates the body 21 until one of the bellows 23 is in a position, also just short of the label transfer position, a point which will hereinafter be referred to as bellows holding position. The position of the bellows 23 is detected by the applicator sensor 27 and, therefore, the bellows 23 can be accurately placed in the bellows holding position under the action of the applicator drive mechanism 22.

Once the labelling apparatus has carried out this initiation sequence, it is ready for labelling of fruit or vegetables to begin.

It will be appreciated that this initiation sequence is carried out automatically without the need for manual intervention by an operator. This is true despite the fact that the label holding position is dependent on the label used. The use of stepper motor drives and the sensor to detect the label position and bellows position means that automatic initiation can take place whatever the label size.

The fruit or vegetables passing under the apparatus 10 on a conveyor 31 are detected by a fruit or vegetable sensor 29 and a labelling sequence is then initiated.

- 9 -

As the fruit or vegetable 12 to be labelled is detected by the fruit or vegetable sensor 29, a signal is sent to the label and applicator drive mechanisms 17 and 22 by the control device 24. The control device causes the label drive mechanism 17 to be operated to advance the label strip 16 from the label holding position to the label transfer position. The control device 24 causes the applicator drive mechanism 22 to rotate the body 21 such that the bellows 23 in the bellows holding position is advanced through the bellows receiving position. As described in the above-mentioned European Application, at the bellows receiving position, the bellows is connected to a source of a vacuum whereby the label at the label transfer position can be taken up on the end of the bellows 23 and retained there by the vacuum. Once the label has been taken up by the bellows 23, as described above control device 24 continues the operation of the label and applicator drive mechanisms 17 and 22 until the label sensor 26 detects the leading edge of the next label on the label strip 16 and hence when the next label is in the label holding position, and until the applicator sensor 27 detects the next bellows 23 in the bellows holding position. With a multiplicity of bellows 23 on the body 21, it will be appreciated that as successive bellows 23 are brought to the bellows receiving position to receive a label, other bellows, which have already received labels earlier, will have moved through to a label applying position. At the label applying position, as described in the above-mentioned

- 10 -

European Patent Application, the bellows 23 is connected to a source of low pressure air and, therefore, the bellows 23 expands to bring the end of the bellows 23 into contact with a fruit or vegetable thereby transferring the label to a surface of the fruit or vegetable.

5 It will be appreciated that in order for the labelling apparatus to operate successfully, the control of the drive mechanisms 17, 22 and positioning of the label strip 16 (and hence labels) and the bellows 23 is very important. Known labelling apparatus which operate in this manner, for example as disclosed in the above-mentioned European patent
10 Application, utilise a mechanical clutch arrangement to control operation of the drive mechanisms 17, 22. If a differently sized label or differently spaced labels are used, the clutch arrangement will need to be modified or replaced in order to be able to ensure that the apparatus operates to apply the new size of label accurately. Further a change in the type of labels
15 used will necessitate a manual re-setting of the apparatus.

 In the present invention, the use of a stepper motor drive obviates the requirement for a mechanical clutch. This means that no change in the drive mechanism is necessary to ensure different size labels can be accommodated. The stepper motor can be driven to advance the label the
20 correct distance to ensure its accurate placement at the label holding position. The label sensor detects the leading edge of the label and halts the stepper motor when the label reaches the correct label holding position.

- 11 -

Still further the use of an applicator sensor allows accurate positioning of the bellows in the bellows holding position.

Further the present Applicants have also realised that, by incorporating a memory 32 within the control device 28 which controls operation of the drive mechanisms 17, 22, into which can be stored parameters relating to different label sizes, the automatic initiation of the apparatus is further facilitated. These parameters should include data which is required to ensure that for different label sizes the positioning of the label at the label transfer position, can be accurately determined for each label size. It can also be arranged for the control device 28 to include a user selector (not shown) by which a user of the labelling apparatus can select a particular label size from those stored and by doing this the stored parameters relating to that label size are automatically utilised by the labelling apparatus to allow accurate initiation and labelling for the type of label selected.

Still further the use of stepper motor drives for the label and applicator drive mechanisms 17 and 22 enables accurate complex movement of the drive mechanism to be utilised to ensure accurate positioning of the bellows and label. In particular, the use of stepper motor drives allows the applicator and label strip to be driven in either direction.

This is clearly not possible with known arrangements in which a clutch mechanism is utilised.

- 12 -

It is of course to be understood that the invention is not intended to be restricted to the above embodiments which are by way of example only.

- 13 -

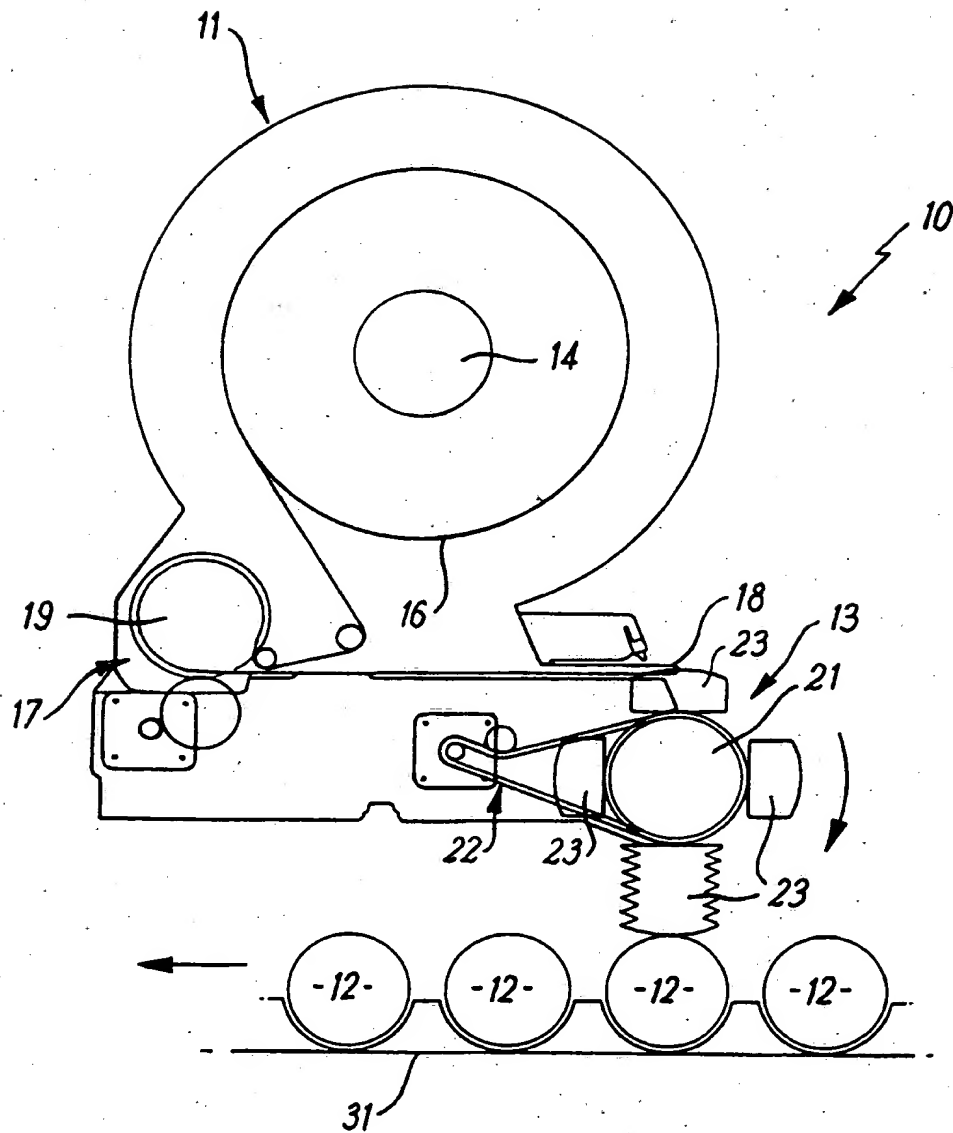
CLAIMS

1. A labelling apparatus comprising a label supply and a label applicator,
said label supply being operable to supply labels to said label
applicator and said applicator being operable to apply said labels to
5 fruit and vegetables, wherein said label supply is driven by a label
drive mechanism and said label applicator is driven by an applicator
drive mechanism, said drive mechanisms comprising respective
stepper motor drives.
2. A labelling apparatus according to claim 1, wherein movement of the
10 applicator and the labels are sensed by respective sensors, said
respective sensors being connected to said label drive mechanism
and said applicator drive mechanism respectively whereby positioning
of the applicator and labels can be controlled accurately.
3. A labelling apparatus according to claim 1 or claim 2, further
15 including a memory device, said memory device being connected to
said respective drive mechanisms and being operable to send drive
signals to the drive mechanisms.
4. A labelling apparatus according to any one of claims 1 to 3, wherein
the memory device stores a series of parameters relating to different
20 labels.
5. A labelling apparatus according to claim 4, wherein the apparatus
further includes a user operable input linked to said memory device

- 14 -

whereby a user can input data or select one or more of said labels or parameters stored in the memory device.

6. A labelling apparatus according to any one of claims 3 to 5, wherein the memory device comprises an electrically erasable read-only memory (EEPROM).

***Fig. 1***

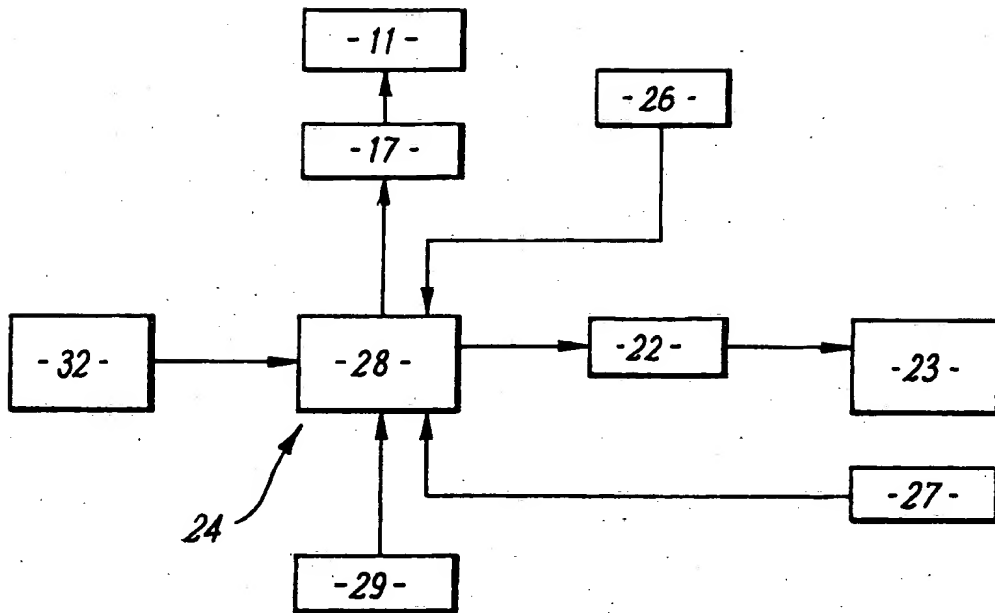


FIG. 2

INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/GB 00/01012

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65C9/18 B65C9/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 472 552 A (SPERANZA PHILIP ET AL) 5 December 1995 (1995-12-05)	1
Y	column 6, line 56 - line 60 column 7, line 35 column 8, line 24 - line 25 column 11, line 34 - line 36 figure 1	2
Y	US 5 431 274 A (SCHAUPP RICHARD E) 11 July 1995 (1995-07-11) column 8, line 53 - line 60 column 9, line 6 - line 10 column 9, line 27 - line 31 column 10, line 43 - line 65	2
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

30 June 2000

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